

LEAF SURFACE FUNGI OF *ZIZANIA LATIFOLIA* (GRISEB.) TURCZ.

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SUMMARY. — Leaf surface fungi of *Zizania latifolia* have been investigated for one year (1983). Fungal genera recorded on the phyllosphere region of green and yellow leaves were 23 and 19 respectively. Whereas, the fungal genera recorded on the phylloplane region of green and yellow leaves were 11 and 12 respectively. The dominant genera on the phyllosphere regions were mostly different. However, no dominant form was isolated from the phylloplane region of both green and yellow leaves. The presence of abundant *Melanopsichium esculentum* P. Henn. spores, a smut parasite of *Zizania latifolia*, was recorded in three months only viz. - January, February and December.

RESUMÉ. — L'étude des champignons sur feuilles de *Zizania latifolia* a été effectuée durant l'année 1983. Le nombre de genres identifiés dans la phyllosphère des feuilles vertes est de 23 et de 19 pour les jaunes, tandis que sur le phylloplan il est, respectivement de 11 et 12. Quelques genres dominants se rencontrent dans la phyllosphère tandis que le phylloplan n'en présente pas. *Melanopsichium esculentum* (parasite de *Zizania latifolia*) n'a été rencontré que durant les mois de Janvier, Février et Décembre.

MOTS-CLÉS : *Zizania latifolia*, Fungi, Phyllosphere, Phylloplan.

INTRODUCTION

The aerial surface of higher plants growing under natural conditions are usually covered with large and varied populations of microorganisms (DICKINSON, 1976). GREGORY (1973) described the correlation between aërospora over a particular plant and its leaf surface microflora. Leaf surface microbes and their complex ecology have been receiving more and more research attention since 1950's (LAST, 1955; DICKINSON, 1965, 1976; MISHRA & SRIVASTAVA, 1970; LINDSEY, 1976, etc.). In the present paper fungal genera including *M. esculentum* isolated from the phyllosphere and phylloplane regions of *Z. latifolia* for one year (from January to December, 1983) are presented.

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MATERIALS AND METHODS

Four growth stages of *Z. latifolia* were classified. They are : *seedling stage* (January - March), *pre-flowering stage* (April - June); *flowering stage* (July - September) and *fruiting stage* (October - December). The leaf samples of both green and yellow were collected randomly from the plants growing in a pond near Library building, Manipur University, Canchipur (23°47' - 25°41'N. Lat. and 93°61' - 94°48'E. long). Leaf surface fungi were studied following MISHRA & SRIVASTAVA method (1971). Plant materials were cut into 1-2 cm long pieces and grouped into equal amounts for each type. Each group was taken in a pre-sterilized 250 cc conical flask with glass stopper containing 200 cc of sterilized distilled water. The flask was shaken for 30 minutes vigorously by hand. Five to six drops of exudate were inoculated in 8 petridishes containing Czapek dox agar (CDA) in 4 replicates and Potato dextrose agar (PDA) in 4 replicates maintaining both media pH 6.8 to 7.0. These washings were used for « phyllosphere » study. The plant pieces were taken out from the flasks and thoroughly washed by distilled water twenty times. Five pieces of the washed materials were kept in each pair of petridish containing the above noted media for the « phylloplane » study. The plants were incubated for 7 to 30 days at 27°C ± 1 and the fungi were identified up to generic level.

RESULTS

The number of fungal population on the phyllosphere region of the green leaves was recorded maximum (23) and minimum (4) in the flowering and seedling stages respectively (Table 2). Out of the maximum 23 genera, Actinomycetes, *Alternaria*, *Aspergillus*, *Cladosporium*, *Mucor*, *Pestalotia*, *Penicillium*, *Rhizopus*, and Sterile mycelium were dominant (Table 1). On the phylloplane region of the green leaves 11 genera were recorded. The number of genera were least recorded at the seedling stage (4) and maximum at flowering stage (11). In the yellow leaves 19 genera were isolated from phyllosphere region and 12 genera in the phylloplane region (Table 1). Of the 19 genera of the phyllosphere region, Actinomycetes, *Aspergillus*, Black hyaline mycelium, *Chaetomium*, *Helminthosporium*, *Penicillium* and *Rhizopus* were dominant whereas no significant dominant forms were noted in the phylloplane region. Some dominant genera of the phyllosphere region of both green and yellow leaves for four growing seasons are given in Table 3. Thought there were a few dominant genera in the seedling and fruiting stages the abundance of *M. esculentum* spores was also recorded. Fungal population generally increased from the seedling stage to the flowering stage reaching the peak population and decreased slightly in the fruiting stage. Some genera like Black hyaline mycelium *Torula*, *Curvularia*, *Drechslera*, and *Humicola* were rarely present both in the phyllosphere and phylloplane regions of green and yellow leaves. *M. esculentum* spores were found during the months of January, February, March, April and December, 1983.

FUNGAL GENERA	Green leaves surface		Yellow leaves surface	
	Ps	Pp	Ps	Pp
<i>Absidia</i> van Tieghem	+	-	+	-
<i>Actinomyces</i>	++	-	++	-
<i>Alternaria</i> Nees.	+	-	+	+
<i>Aspergillus</i> Micheli.	++	-	++	+
<i>Aureobasidium</i> Viala & Boyer	+	-		
Black hyaline mycelium	-	+	++	-
<i>Botrytis</i> Pers.	+	-		
<i>Chaetomium</i> Kunze.	+	-	++	+
<i>Cladosporium</i> Link.	++	+	+	+
<i>Curvularia</i> Boedijn.	+	+	-	+
<i>Drechslera</i> Ito.	+	+	-	+
<i>Fusarium</i> Link.	+	-	++	+
<i>Helminthosporium</i> Link.	+	-	+	-
<i>Humicola</i> Traaen.	+	-	-	+
<i>Melanopsichium esculentum</i> P. Henn.	+	-	+	-
<i>Monilia</i> Pers.	+	+	+	-
<i>Mucor</i> Mich.	++	+	+	+
<i>Nigrospora</i> Zimm.	+	-	+	-
<i>Pestalotia</i> de Not.	++	-	+	-
<i>Penicillium</i> Link.	++	-	++	+
<i>Rhizopus</i> Ehrenb.	++	+	++	+
Rust spore	+	-	+	-
Smut spore	+	-	+	-
Sterile mycelium	++	+	+	-
<i>Torula</i> (Pers.) Link.	-	+	-	+

Table 1. — Fungal genera isolated from phyllosphere (Ps) and phylloplane (Pp) of green and yellow leaves surface of *Zizania latifolia*.

— Absent, + Present, ++ Dominant.

Tableau 1. — Population fongique de la surface foliaire de *Zizania latifolia*.

— Absent, + Present, ++ Dominant.

Sampling period	Green leaves				Yellow leaves			
	Ps		Pp		Ps		Pp	
	No. of spp.	Cols./plate	No. of spp.	Cols./plate	No. of spp.	Cols./plate	No. of spp.	Cols./plate
0 January	4	12	4	9	—	—	—	—
0 February	5	16	6	10	—	—	—	—
0 March	8	18	8	15	—	—	—	—
X April	9	25	7	21	7	22	3	8
X May	12	36	9	30	12	35	6	12
X June	15	60	10	35	15	41	8	21
* July	18	68	8	21	12	34	6	10
* August	16	76	10	40	18	61	5	12
* September	23	149	11	45	19	101	7	15
+ October	21	130	7	31	18	87	12	25
+ November	20	111	6	12	14	42	10	21
+ December	15	80	5	7	15	51	4	11

Table 2

Growth stage	Green	Yellow
Seedling stage	<i>Penicillium</i> <i>Melanopsichium</i> <i>esculentum</i> Actinomycetes	<i>Aspergillus</i> Black hyaline mycelium
Pre-flowering stage	<i>Rhizopus</i> <i>Aspergillus</i> <i>Mucor</i>	<i>Chaetomium</i> <i>Aspergillus</i>
Flowering stage	sterile mycelium <i>Pestalotia</i> <i>Mucor</i> <i>Penicillium</i> Actinomycetes	<i>Chaetomium</i> <i>Fusarium</i> <i>Rhizopus</i> <i>Penicillium</i>
Fruiting stage	<i>Penicillium</i> <i>Cladosporium</i> Actinomycetes <i>Melanopsichium</i> <i>esculentum</i>	Actinomycetes Black hyaline mycelium <i>Rhizopus</i>

Table 3

DISCUSSION

The fungal genera isolated from the phyllospheres of green and yellow leaves were almost common, however, some dominant genera were found different at various stages of the plant growth. Similar observations were made by MISHRA & SRIVASTAVA (1971). They also reported that leaves of different growth stages of the plant harboured specific fungi. The presence of the black hyaline mycelium and *Fusarium* in the phyllosphere region of the yellow leaves during the present investigation is supported by MISHRA & SRIVASTAVA (1971). Some fungal genera present on the phyllosphere of both green and yellow leaves were not found on their respective phylloplane regions (DICKINSON, 1965; MISHRA & SRIVASTAVA, 1971).

The presence of some smut spores including *M. esculentum* were recorded throughout the season but the density was maximum in the fruiting (October to December) and seedling (January to March) stages. As there were two stages during which the distribution of *M. esculentum* spores was maximum, chances of infection during the two stages were fair. Generally this fungus favours meristematic tissues of the host for its vigorous growth (CHAN & THROWER, 1980). It seems from the present investigation that initiation of infection was more favourable during the seedling stage of the host. A similar observation was noticed earlier (YANG & MEU, 1978).

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Table 2. — Fungal population on the leaf-surfaces of *Zizania latifolia* at different stages of growth (1983).

0 - Seedling stage; X - Pre-flowering stage; * - Flowering stage; + - Fruiting stage.

Ps : Phyllosphere - Pp : Phylloplane

Tableau 2. — Population fongique de la surface foliaire de *Zizania latifolia* à différents stades de développement (année 1983).

0 - jeune plant; X - stade avant la floraison; * - floraison; + - fructification.

Ps : phyllosphère - Pp : Phylloplan.

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Table 3. — Dominant fungal genera including *Melanopsichium esculentum* on the phyllosphere region of the four growth stages of *Zizania latifolia*.

Tableau 3. — Genres de champignons dominants rencontrés dans la phyllosphère de *Zizania latifolia* à quatre stades de développement.

REFERENCES

- CHAN Y.S. and THROWER L.B., 1980. — The host - parasite relationship between *Zizania caduciflora* Turcz. and *Ustilago esculenta* P. Henn. I. Structure and development of the host - parasite combination. *New Phytol.* 85 : 201-207.
- DICKINSON C.H., 1965. — The mycoflora associated with *Halimione portulacoides*. III. Fungi on green and moribund leaves. *Trans. Brit. mycol. Soc.* 48 : 4 : 630-610.
- DICKINSON C.H., 1976. — Fungi on aerial surface of higher plants. In : DICKINSON C.H. & PREECE T.F., *Microbiology of Aerial plant surfaces*. London, Academic Press, pp. 293-324.
- GREGORY P.H., 1973. — The microbiology of the atmosphere. London, Leonard Hill.
- LAST F.T., 1955. — Seasonal incidence of *Sporobolomyces* on Cereal leaves. *Trans. Brit. mycol. Soc.* 38 : 221-239.
- LINDSEY B.I., 1976. — A survey of methods used in the study of microfungal succession on leaf surfaces. In : DICKINSON C.H. & PREECE T.F., *Microbiology of aerial plant surfaces*. London, Academic Press, pp. 217-222.
- MISHRA R.R. and SRIVASTAVA V.B., 1970. — Microflora of Leaf surface in Relation to virus infection. *Sydowia* 24 : 120-125.
- MISHRA R.R. and SRIVASTAVA V.B., 1971. — Leaf surface fungi of *Oryza sativa* Linn. *Mycopathol. Mycol. Appl.* 44 : 289-294.
- YANG H.C. and LEU L.S., 1978. — Formation and histopathology of galls induced by *Ustilago esculenta* in *Zizania latifolia*. *Phytopathology* 68 : 1572-1576.